# SUBSURFACE CONTAMINATION ASSESSMENT

# A. F. C. INCORPORATED PLANT

# CHATFIELD, MINNESOTA

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# CHATFIELD, MINNESOTA

#4800 : 88-158

twin city testing
corporation

3908 COMMERCE COURT S.W.
ROCHESTER, MN 55902-1252
PHONE 507/288-7060

March 4, 1988

A. F. C. Incorporated
Highway 52 South
Chatfield, MN 55923

Attn: Mr. Dennis Thorson

Subj: Soil Styrene Contamination Assessment
A. F. C. Incorporated Plant
Chatfield, Minnesota
#4800 88-158

Dear Mr. Thorson:

Enclosed is a report of our soil contamination assessment for styrene at your Chatfield, Minnesota plant. We are forwarding two copies of this report to you at this time.

All soil samples acquired at the site will be retained at our laboratory for a period of 30 days from the date of this report. The soil samples will then be returned to the site unless we are otherwise notified.

Twin City Testing Corporation appreciates the opportunity to be of service in regard to this project. If you have any questions regarding the information in this report, or if we can be of further assistance, please contact me.

Very truly yours

Bradley J. Peschong
Environmental Geologist

BJP/mcb

Encs.

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SUBSURFACE CONTAMINATION ASSESSMENT

A. F. C. INCORPORATED PLANT

CHATFIELD, MINNESOTA

#4800 88-158

# 1.0 INTRODUCTION

## 1.1 Purpose and Scope

The purpose of this project was to assess the contamination of soil at the site of a recent styrene spill at the A. F. C. Inc. plant in Chatfield, Minnesota. This report presents the data, methodologies and results of this assessment. Twin City Testing Corporation was authorized by Mr. Dennis Thorson on February 10, 1988, to perform this work.

The scope of services provided during this project included the following items.

1. Mobilization of a drill rig and crew to the site to advance one soil boring;
2. Mobilization of a field observer to collect soil samples for laboratory analysis.
3. Laboratory analysis of four soil samples for concentration of styrene;
4. Preparation of a factual report presenting the data and methodologies in relation to work performed at this site.

## 1.2 Site Location and Description

The site is located at A.F.C.'s manufacturing building southeast of Chatfield, Minnesota, on Highway 52 South (see Figure 1).

# 2.0 PROJECT RESULTS

## 2.1 Soil Boring

One (1) soil boring was advanced at a location determined by Mr. Dennis Thorson (see Figure 2). The site chosen was identifed by Mr. Thorson as being in the area of greatest styrene accumulation following the spill. The boring location was on the north side of the gravel driveway leading to the building's loading dock. The loading dock is at the southern corner of the facility (see Figure 2). The flat driveway area is bounded on the north by a 5' to 6' embankment, presumably topsoil, leading up to the resin storage building. The methods used to advance the boring are described in Appendix A.

Boring #1 was advanced to a depth of 6.7' where advancement was obstructed on limestone. The general soil profile encountered in the boring consisted of 2' of fill overlying 3' of coarse alluvial sands.

2.1 Soil Boring (continued)

These alluvial deposits in turn overlie limestone bedrock of the Shakopee Formation. Our boring at this site did not encounter the ground water table.

The soil boring log is included in Appendix B.

2.2 Soil Sampling and Laboratory Analysis

Soil sampling was done continuously over the 6.7' of boring. Composite samples of each 2' to 2-1/2' split barrel sampler was collected and submitted for laboratory analysis of styrene concentration.

Chemical analysis of these samples indicate styrene concentrations ranging from 530 parts per million (ppm) at depths of 1' to 2-1/2', to 4 ppm at depths of 2-1/2' to 4-1/2' (see Table 1).

The chemical laboratory report is included in Appendix C.

## 3.0 REMARKS

As required by State law, the Minnesota Pollution Control Agency (MPCA) should be alerted to the conditions noted on site if they have not been already. Also, TCT is not responsible for any interpretation of our chemical or soil boring data presented.

This report was prepared in accordance with currently accepted geologic and engineering practices at this time and location. Other than this, no warranty is implied or intended.

This report was prepared by:

Bradley J. Peschong
Environmental Geologist

Proofread by:

"Not to Scale"

FIGURE 1: SITE LOCATION MAP

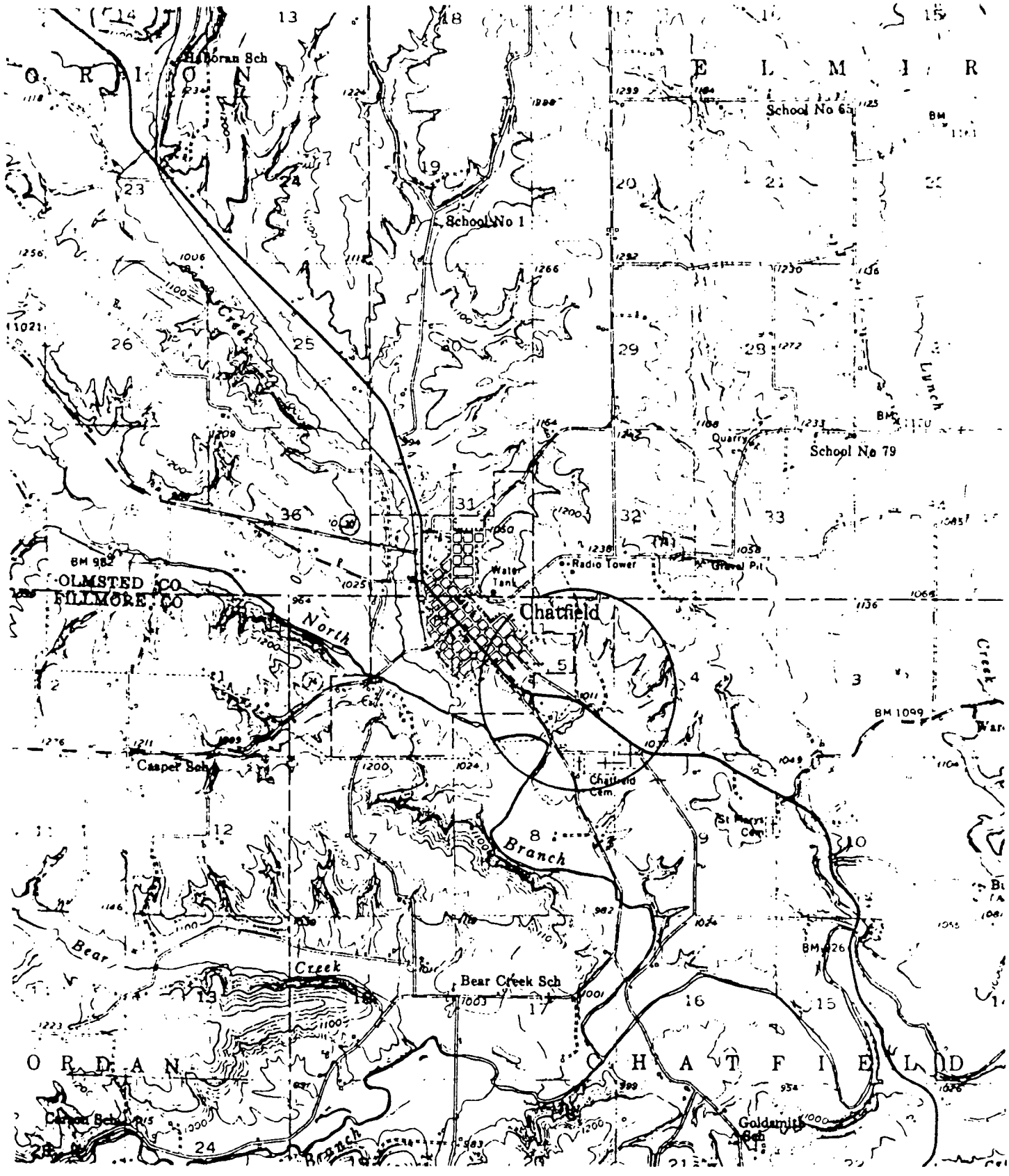
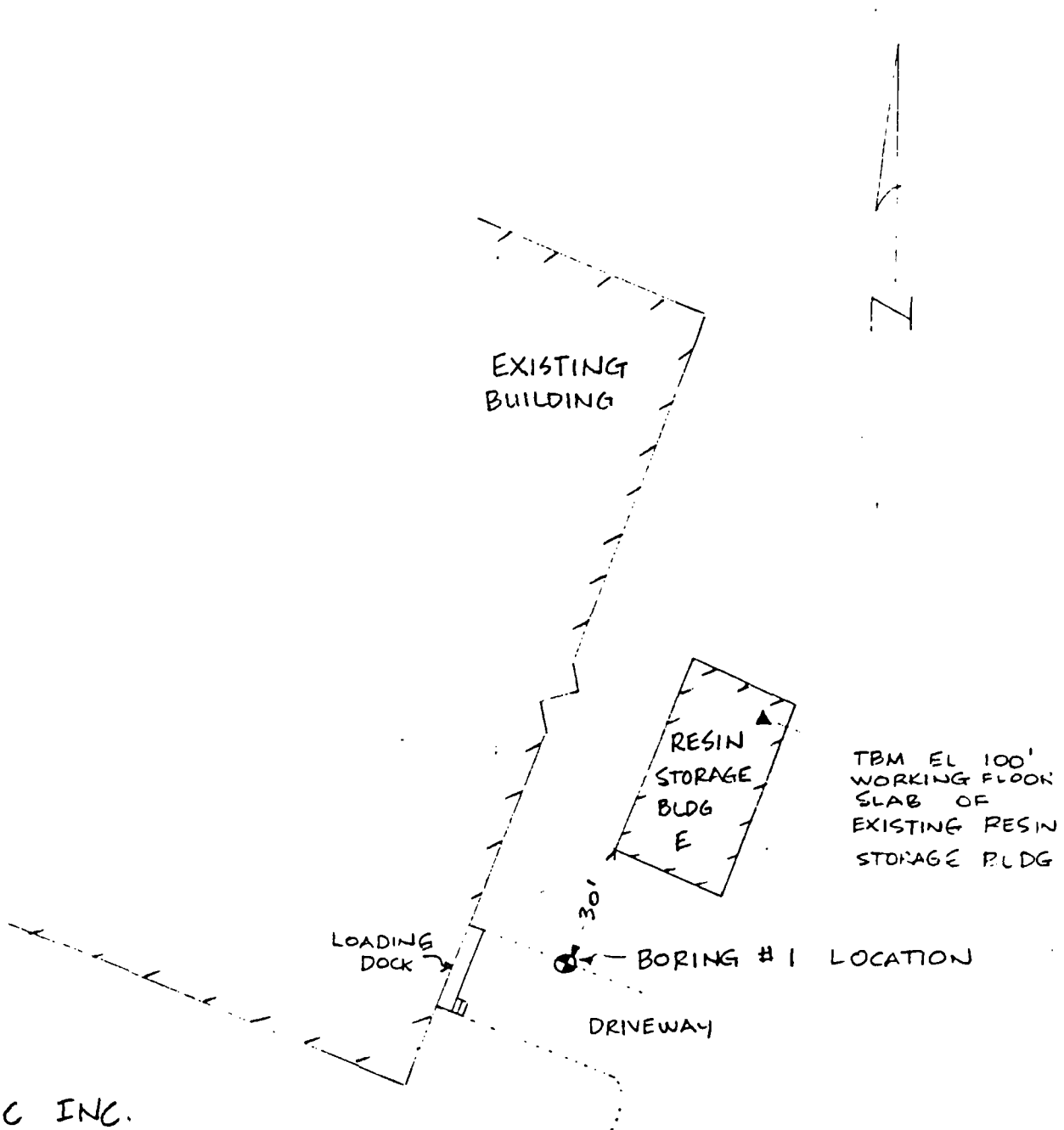


FIGURE 2: SITE PLAN MAP




AFC INC.
CHATFIELD, MN

| | JOB NO. 4800-88-158 | SCALE: 1"=40' | DRAWN BY BP | CHECKED BY |
|---|---|---|---|---|

# TABLE 1

## CHEMICAL ANALYSIS SUMMARY: SOIL SAMPLES

## A. F. C. INCORPORATED PLANT

## CHATFIELD, MINNESOTA

| POINT SAMPLED | DATE SAMPLED | PARAMETER CONCENTRATION (ppm) |
|---|---|---|
| Boring #1 Depth | | Styrene |
| 0 - 1' | 2-10-88 | 340 |
| 1' - 2½' | 2-10-88 | 530 |
| 2½' - 4½' | 2-10-88 | 4 |
| 4½' - 6½' | 2-10-88 | 31 |
| LDL | | 1 |

LDL - lower detection limit

ppm - parts per million

# APPENDIX A

METHODS

# APPENDIX A

## A-1 Soil Sampling

Soil Sampling was done in accordance with ASTM:D1586-84. Using this procedure, a 2" O.D. split barrel sampler is driven into the soil by a 140 lb. weight falling 30". After an initial set of 6", the number of blows required to drive the sampler an additional 12" is known as the penetration resistance or N value. The N value is an index of the relative density of cohesionless soils and the consistency of cohesive soils.

As the samples were obtained in the field, they were visually and manually classified by the crew chief in accordance with ASTM:D2488. Representative portions of the samples were then returned to the laboratory for further examination and for verification of the field classification. A log of the boring indicating the depth and identification of the various strata, the N value, water level information and pertinent information regarding the method of maintaining and advancing the drill hole is attached. Charts illustrating the soil classification procedure, the descriptive terminology and the symbols used on the boring log are also attached.

# A P P E N D I X  A (continued)

## A-2 Soil Sampling and Chain of Custody

Soil samples were collected in laboratory prepared glass containers with teflon lids.

Upon completion of a sample, a chain of custody log was initiated. The chain of custody record included the following information: project, work order number, shipped by, shipped to, sampling point, location, field ID number, data and time taken, sample type, number of containers, analysis required, sampler(s) signature(s), etc. As few people as possible handled the samples.

The chain of custody records were shipped with the samples to the laboratory. Upon arrival at the laboratory, the samples were checked in and signed over to the appropriate laboratory personnel. A copy of the chain of custody was turned over to the project manager. Upon completion of the laboratory analysis, the completed chain of custody record was returned to the project manager.

**APPENDIX B**

SOIL BORING LOG

-

GENERAL NOTES

-

CLASSIFICATION OF SOILS

# LOG OF TEST BORING

JOB NO. 4800 88-158 VERTICAL SCALE 1" = 3' BORING NO. 1

PROJECT A. F. C. INCORPORATED PLANT - CHATFIELD, MINNESOTA

| DEPTH IN FEET | DESCRIPTION OF MATERIAL (SURFACE ELEVATION 95.4') | GEOLOGIC ORIGIN | N | WL | SAMPLE NO | SAMPLE TYPE | LABORATORY TESTS W | D | LL/PL | Qu |
|---|---|---|---|---|---|---|---|---|---|---|
| | FILL, a mixture of SILTY SAND AND SILT, a little weathered Limestone and Lean Clay, brown and dark brown and black, frozen | FILL | | | 1 | HSA | | | | |
| 2 | SAND W/SILT, fine to medium grained, yellowish brown, moist, loose, a few pieces of limestone, a lens of Silty Sand at 3½' (SP-SM) | COARSE ALLUVIUM | 55 | | 2 | SB | | | | |
| | | | 5 | | 3 | SB | | | | |
| 5 | WEATHERED LIMESTONE, grayish tan | SHAKOPEE FORMATION | 107 | | 4 | SB | | | | |
| | | | | | 5 | HSA | | | | |
| 6.7 | OBSTRUCTION: End of Boring | | | | | | | | | |

## WATER LEVEL MEASUREMENTS

| DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | BAILED DEPTHS | WATER LEVEL |
|---|---|---|---|---|---|---|
| 2-10 | 10:15 | 6.7' | 6.7' | 6.7' | to | None |
| | | | | | to | |
| | | | | | to | |
| | | | | | to | |

START 2-10-88 COMPLETE 2-10-88

METHOD @ 10:15

HSA 0-6.7'

CREW CHIEF K. Johnson

# GENERAL NOTES

## DRILLING AND SAMPLING SYMBOLS

| SYMBOL | DEFINITION |
|---|---|
| HSA | 3 1/4" I.D. Hollow Stem Auger |
| _FA | 4", 6" or 10" Diameter Flight Auger |
| HA | 2", 4" or 6" Hand Auger |
| DC | 2 1/2", 4", 5" or 6" Steel Drive Casing |
| RC | Size A, B, or N Rotary Casing |
| PD | Pipe Drill or Cleanout Tube |
| CS | Continuous Split Barrel Sampling |
| DM | Drilling Mud |
| JW | Jetting Water |
| SB | 2" O.D. Split Barrel Sample |
| _L | 2 1/2" or 3 1/2" O.D. SB Liner Sample |
| _T | 2" or 3" Thin Walled Tube Sample |
| 3TP | 3" Thin Walled Tube (Pitcher Sampler) |
| _TO | 2" or 3" Thin Walled Tube (Osterberg Sampler) |
| W | Wash Sample |
| B | Bag Sample |
| P | Test Pit Sample |
| _Q | BQ, NQ, or PQ Wireline System |
| _X | AX, BX, or NX Double Tube Barrel |
| CR | Core Recovery - Percent |
| NSR | No Sample Recovered, classification based on action of drilling equipment and/or material noted in drilling fluid or on sampling bit. |
| NMR | No Measurement Recorded, primarily due to presence of drilling or coring fluid. |
| ▼ | Water Level Symbol |

## TEST SYMBOLS

| SYMBOL | DEFINITION |
|---|---|
| W | Water Content - % of Dry Wt. - ASTM D 2216 |
| D | Dry Density - Pounds Per Cubic Foot |
| LL, PL | Liquid and Plastic Limit - ASTM D 4318 |
| | Additional Insertions in Last Column |
| Qu | Unconfined Comp. Strength-psf - ASTM D 2166 |
| Pq | Penetrometer Reading - Tons/Square Foot |
| Ts | Torvane Reading - Tons/Square Foot |
| G | Specific Gravity - ASTM D 854 |
| SL | Shrinkage Limits - ASTM D 427 |
| OC | Organic Content - Combustion Method |
| SP | Swell Pressure - Tons/Square Foot |
| PS | Percent Swell |
| FS | Free Swell - Percent |
| pH | Hydrogen Ion Content, Meter Method |
| SC | Sulfate Content - Parts/Million, same as mg/L |
| CC | Chloride Content - Parts/Million, same as mg/L |
| C* | One Dimensional Consolidation - ASTM D 2435 |
| Qc* | Triaxial Compression |
| D.S.* | Direct Shear - ASTM D 3080 |
| K* | Coefficient of Permeability - cm/sec |
| D* | Dispersion Test |
| DH* | Double Hydrometer - ASTM D 4221 |
| MA* | Particle Size Analysis - ASTM D 422 |
| R | Laboratory Resistivity, in ohm - cm - ASTM G 57 |
| E* | Pressuremeter Deformation Modulus - TSF |
| PM* | Pressuremeter Test |
| VS* | Field Vane Shear - ASTM D 2573 |
| IR* | Infiltrometer Test - ASTM D 3385 |
| RQD | Rock Quality Designation - Percent |

* See attached data sheet or graph

## WATER LEVEL

Water levels shown on the boring logs are the levels measured in the borings at the time and under the conditions indicated. In sand, the indicated levels may be considered reliable ground water levels. In clay soil, it may not be possible to determine the ground water level within the normal time required for test borings, except where lenses or layers of more pervious waterbearing soil are present. Even then, an extended period of time may be necessary to reach equilibrium. Therefore, the position of the water level symbol for cohesive or mixed texture soils may not indicate the true level of the ground water table. Perched water refers to water above an impervious layer, thus impeded in reaching the water table. The available water level information is given at the bottom of the log sheet.

## DESCRIPTIVE TERMINOLOGY

| DENSITY TERM | "N" VALUE | CONSISTENCY TERM |
|---|---|---|
| Very Loose | 0-4 | Soft |
| Loose | 5-8 | Medium |
| Medium Dense | 9-15 | Rather Stiff |
| Dense | 16-30 | Stiff |
| Very Dense | Over 30 | Very Stiff |

Standard "N" Penetration: Blows Per Foot of a 140 Pound Hammer Falling 30 inches on a 2 inch OD Split Barrel Sampler

| | |
|---|---|
| Lamination | Up to 1/2" thick stratum |
| Layer | 1/2" to 6" thick stratum |
| Lens | 1/2" to 6" discontinous stratum, pocket |
| Varved | Alternating laminations of clay, silt and /or fine grained sand, or colors thereof |
| Dry | Powdery, no noticeable water |
| Moist | Below saturation |
| Wet | Saturated, above liquid limit |
| Waterbearing | Pervious soil below water |

## RELATIVE GRAVEL PROPORTIONS

| CONDITION | TERM | RANGE |
|---|---|---|
| Coarse Grained Soils | A little gravel | 2 - 14% |
| | With gravel | 15 - 49% |
| Fine Grained Soils | | |
| 15-29% + No. 200 | A little gravel | 2 - 7% |
| 15-29% + No. 200 | With gravel | 8 - 29% |
| 30% + No. 200 | A little gravel | 2 - 14% |
| 30% + No. 200 | With gravel | 15 - 24% |
| 30% + No. 200 | Gravelly | 16 - 49% |

## RELATIVE SIZES

| | |
|---|---|
| Boulder | Over 12" |
| Cobble | 3" - 12" |
| Gravel | |
| Coarse | 3/4" - 3" |
| Fine | #4 - 3/4" |
| Sand | |
| Coarse | #4 - #10 |
| Medium | #10 - #40 |
| Fine | #40 - #200 |
| Silt & Clay | -#200, Based on Plasticity |

# CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES
ASTM Designation: D 2487 - 83
(Based on Unified Soil Classification System)

# SOIL ENGINEERING

| | | | Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A] | Soil Classification: Group Symbol | Soil Classification: Group Name[B] |
|---|---|---|---|---|---|
| Coarse-Grained Soils More than 50% retained on No. 200 sieve | Gravels More than 50% coarse fraction retained on No. 4 sieve | Clean Gravels Less than 5% fines[C] | $Cu \geq 4$ and $1 \leq Cc \leq 3^E$ | GW | Well graded gravel[F] |
| | | | $Cu < 4$ and/or $1 > Cc > 3^E$ | GP | Poorly graded gravel[F] |
| | | Gravels with Fines More than 12% fines[C] | Fines classify as ML or MH | GM | Silty gravel[F,G,H] |
| | | | Fines classify as CL or CH | GC | Clayey gravel[F,G,H] |
| | Sands 50% or more of coarse fraction passes No. 4 sieve | Clean Sands Less than 5% fines[D] | $Cu \geq 6$ and $1 \leq Cc \leq 3^E$ | SW | Well-graded sand[I] |
| | | | $Cu < 6$ and/or $1 > Cc > 3^E$ | SP | Poorly graded sand[I] |
| | | Sands with Fines More than 12% fines[D] | Fines classify as ML or MH | SM | Silty sand[G,H,I] |
| | | | Fines classify as CL or CH | SC | Clayey sand[G,H,I] |
| Fine-Grained Soils 50% or more passes the No. 200 sieve | Silts and Clays Liquid limit less than 50 | inorganic | PI > 7 and plots on or above "A" line[J] | CL | Lean clay[K,L,M] |
| | | | PI < 4 or plots below "A" line[J] | ML | Silt[K,L,M] |
| | | organic | $\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$ | OL | Organic clay[K,L,M,N] Organic silt[K,L,M,O] |
| | Silts and Clays Liquid limit 50 or more | inorganic | PI plots on or above "A" line | CH | Fat clay[K,L,M] |
| | | | PI plots below "A" line | MH | Elastic silt[K,L,M] |
| | | organic | $\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$ | OH | Organic clay[K,L,M,P] Organic silt[K,L,M,Q] |
| Highly organic soils | | | Primarily organic matter, dark in color, and organic odor | PT | Peat |
| Fibric Peat ≥67% Fibers | | | Hemic Peat 33%-67% Fibers | Sapric Peat < 33% Fibers | |

[A] Based on the material passing the 3-in (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

[D] Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant

[L] If soil contains ≥30% plus no. 200, predominantly sand, add "sandy" to to group name.

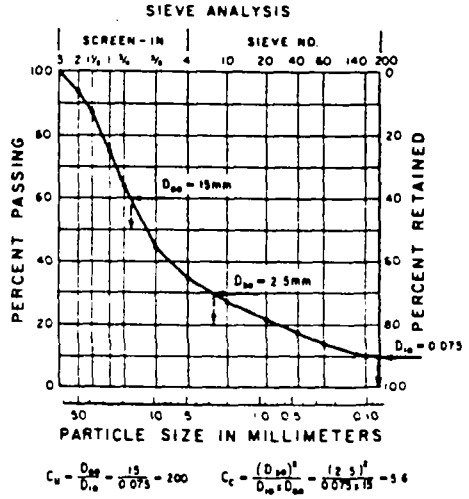
[M] If soil contains ≥30% plus No. 200, predominantly gravel, add "gravelly" to group name

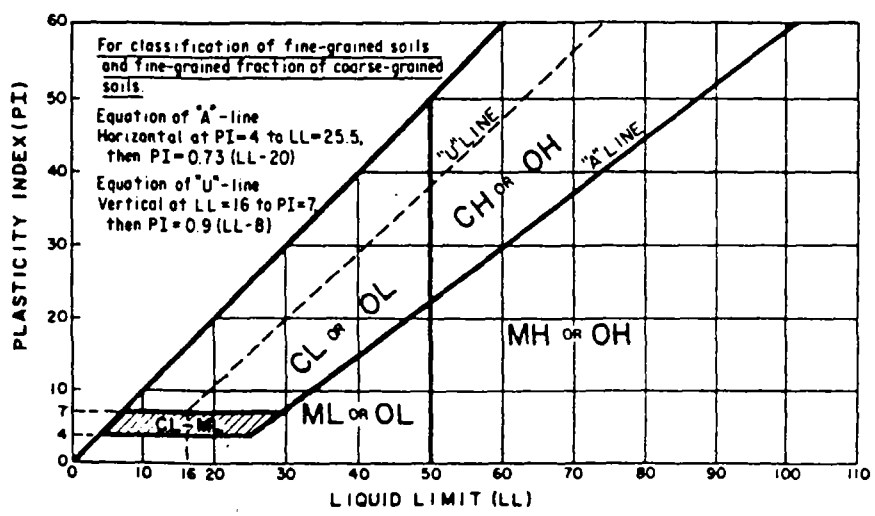
[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line

[P] PI plots on or above "A" line

[Q] PI plots below "A" line



# APPENDIX C

LABORATORY ANALYSIS REPORT

twin city testing
corporation
662 CROMWELL AVENUE
ST. PAUL, MN 55114
PHONE 612/645-3601

REPORT OF: CHEMICAL ANALYSIS

PROJECT: A. F. C. INCORPORATED
CHATFIELD, MINNESOTA

DATE: February 16, 1988

REPORTED TO: A. F. C. Incorporated
Highway 52 South
Chatfield, MN 55923

LABORATORY No. 4410 88-2455
4800 88-158

## INTRODUCTION

This report presents the results of the analyses of four soil samples received on February 11, 1988 from a representative of Twin City Testing Corporation - Rochester Branch. The scope of our analyses was the determination of styrene using gas chromatographic techniques.

## SAMPLE IDENTIFICATION

Sample #1 - TCT #30164
Sample #2 - TCT #30168
Sample #3 - TCT #30169
Sample #4 - TCT #30170

## METHODOLOGY

A portion of each sample was weighed and placed in a glass vial with a septum lid. The sample was then heated for thirty minutes at 100°C. The headspace sample was removed using a gas tight syringe and injected into a Hewlett-Packard 5890 Gas Chromatograph equipped with a flame ionization detector. Styrene was identified by column retention time and quantified by peak area comparisons to those of known standards using a VG Laboratory Data System.

## RESULTS

The results are listed in Table 1.

## REMARKS

The samples were analyzed February 14, 1988. The samples will be held for thirty days from the date of this report and then discarded unless other arrangements are made.

TWIN CITY TESTING CORPORATION

Mark Lanz
GC Group Leader

Chris Bremer, Manager
Chromatography Section

ML/CB/jm

Proofread by JA

# TABLE 1

## CHEMICAL ANALYSIS

| Sample ID | Styrene, (ppm) |
|---|---|
| Sample #1 | 340 |
| Sample #2 | 530 |
| Sample #3 | 4 |
| Sample #4 | 31 |

Values are in parts-per-million which is equal to ug/g.

LDL

Laboratory No. 4410 88-2455
4800 88-158